

**GUIDANCE FOR DETERMINING IF PERSONNEL  
HANDLING FISSIONABLE MATERIALS REQUIRE  
CERTIFICATION**

*July 3, 1996*

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1. PURPOSE

DOE Order 5480.20A, "Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities," requires certification of fissionable material handlers (FMH) and their immediate supervisors. The purpose of this document is to provide guidance and examples that will assist DOE nuclear facilities in identification of positions that require certification as fissionable material handlers to be consistent with the requirements and the intent of the Order.

2. BACKGROUND

DOE 5480.20A requires all employees to receive criticality safety training commensurate with their job duties as part of General Employee Training (GET). The content for this training is required to be in accordance with ANSI/ANS 8.20 - 1991, "Criticality Safety Training."

DOE Order 5480.20A requires FMHs and their supervisors to be certified and defines an FMH as:

*A person certified by contractor facility management to manipulate or handle significant quantities of fissionable materials, or manipulate the controls of equipment used to produce, process, transfer, store, or package significant quantities of such materials.*

This is not a new requirement. Its origin extends to the former Atomic Energy Commission (AEC) Manual Chapter 0530, Nuclear Criticality Safety, first issued on September 17, 1968.

Personnel who handle *significant* quantities of fissionable material are considered to be fissionable material handlers and are required by DOE 5480.20A to be certified.

While the basic elements for certification are the same as for qualification (i.e., prior education and experience, training, examinations, performance demonstrations/operational evaluations, and medical examinations), there are differences. The significant differences (and costs) between designating or not designating a position as certified include the increased resource requirements associated with continuing training, examination, identification and performance of control manipulations, reexamination, maintenance of proficiency, medical reexaminations and recertification. Therefore, it is important that positions selected and designated as requiring certification be carefully identified.

Personnel who handle fissionable materials in quantities that are not significant are not required to be certified. However, these individuals are still required to be trained and qualified to perform their specific job responsibilities. Since one of these responsibilities is handling fissionable materials (in less than significant quantities) they must be trained on relevant criticality safety principles as they relate to their job responsibilities.

### 3. SIGNIFICANT QUANTITIES OF FISSIONABLE MATERIAL

The definitions of the terms relevant to the identification of positions requiring certification include fissionable materials and significant quantities of fissionable materials. In addition, although no longer used, the former definition of "safe mass" contained in AEC MC 0530 and former DOE Order 5480.5 "Safety of Nuclear Facilities" may also be relevant. Definitions of these terms are:

**Fissionable Materials:** Nuclides capable of sustaining a neutron induced fission chain reaction (e.g., uranium-233, uranium-235, plutonium-238, plutonium-239, plutonium-241, neptunium-237, americium-241, and curium-244).

The definition of significant quantities has evolved as follows:

**Significant Quantities:** Masses of fissionable materials greater than a safe mass (from the former DOE 5480.5).

A safe mass being that mass of fissionable materials which is subcritical for all conditions to which it could reasonably be expected to be exposed, including processing, handling, storing, and procedural uncertainties (from the former DOE 5480.5).

Significant Quantity of Fissionable Material: The minimum mass of fissionable material for which control of at least one parameter is required to ensure subcriticality under all normal and credible abnormal conditions (from the former DOE 5480.24).

*The present definition of significant quantity of fissionable material is: the minimum quantity of fissionable material for which control is required to maintain subcriticality under all normal and credible abnormal conditions.*

As a general guideline, a *significant* quantity can be any inventory of fissionable material in individual unrelated areas (e.g., total material located in distinct areas within a facility and controls are placed on the processes to prevent multiple batching, inadvertent transfer, etc.) that exceeds 700 grams of  $^{235}\text{U}$ , 520 grams of  $^{233}\text{U}$ , 450 grams of  $^{239}\text{Pu}$ , or 450 grams of any combination of these isotopes. Significant quantities of other fissionable materials can be found in ANSI/ANS-8.15-1981,R87 "Nuclear Criticality Control of Special Actinide Elements." In some cases determining that a quantity of fissionable material is *significant* is clear and no further analysis is necessary. In other cases the activity must be analyzed to determine whether the quantity is significant in terms of requiring certification. The following guidance/criteria may be used in making this determination and therefore, identifying those positions that need to be certified.

#### A. ANALYSIS OF ACTIVITIES

Certification of operators and their immediate supervisors should be required if the following conditions exist: 1) Personnel are handling quantities of fissionable materials greater than the subcritical limits of ANSI/ANS-8.1-1983, R88 "Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors" and ANSI/ANS-8.15-1981,R87 "Nuclear Criticality Control of Special Actinide Elements," as referenced in DOE O 420.1, section 4.3 "Nuclear Criticality Safety," and 2) A credible criticality scenario is identified in the facility Safety Analysis Report (SAR) or other appropriate documentation or if the activities in a facility require a criticality alarm system.

If personnel are handling quantities of fissionable materials less than the subcritical limits, no credible criticality scenario is identified in the SAR or other appropriate documentation, and a criticality alarm system is not required, then certification is not required.

In cases where activities involve significant quantities of fissionable materials, but engineered and administrative controls essentially eliminate potential for a criticality accident, the following factors should be analyzed to determine whether or not to designate positions as FMHs. Facility criticality safety experts should be the primary resource in analyzing these factors. The decision to require certification should be based on the results of the analysis of the factors described below and should be carefully considered.

(1) Form of Material Precludes Criticality

Certification may not be required where the mass of fissionable material exceeds the subcritical limits established by DOE O 420.1 if it is judged that a criticality accident is extremely unlikely due to its physical form, or if the probability of criticality is determined to be less than  $10^{-6}$ /year as documented in a DOE-approved Safety Analysis Report (SAR) or other appropriate documentation.

(2) Storage in Approved Containers

Certification may not be required for personnel that handle or ship fissionable materials packaged in approved shipping containers. This is true only if no other operation involving fissionable materials is permitted in the shipment area or dock.

(3) Installed Permanent Shielding

Certification may not be required for personnel handling and storing fissionable materials when permanent shielding exists that is adequate to protect personnel and a credible criticality scenario has not been identified. For example, spent fuel pools, hot cells, or burial grounds. Glove boxes do not fall into this category.

(4) Potential for Concentration

Certification may not be required when personnel activities involve aqueous solutions below limiting concentrations required to attain criticality. A key factor to be considered with aqueous solutions when making the determination is the activity being performed.

Can the process, process equipment, or process components collect, build up, or concentrate solutions and exceed the subcritical limits specified and cause a criticality? If this is a credible possibility, then certification should be required for operators and their immediate supervisors.

In addition, only personnel who perform duties involving significant quantities of fissionable material (FMHs) are required by DOE 5480.20A to be certified. For example, if several job positions fall under a job category, but only one position handles significant quantities of fissionable materials, then only that position should be designated as an FMH and be required to be certified. This is important because at many DOE sites, numerous distinctly different jobs have been classified under the same job category. The following section contains example job positions from DOE nuclear facilities that are FMHs. These examples are included to illustrate typical job functions that have been determined to be certified primarily on the basis of handling significant quantities of fissionable materials.

#### 4. EXAMPLE CERTIFIED POSITIONS

The following are examples of positions at DOE nuclear facilities that have been designated as fissionable material handlers.

<u>Position Title</u>	<u>Job Function</u>
*Hot Cell Facility (HCF) Operator	Performs activities in the HCF which include preparation of experiments for the reactor, inspection of irradiated materials and fuel assemblies, and operation of engineered safety systems controls.
*HCF Supervisor	Directs the activities and operation of the HCF.
*FMH Operator	Handles, stores, performs surveillance activities, and inventories irradiated reactor fuel assemblies in a large water basin.

Nuclear Operator	Performs sludge stabilization, facility surveillance, project operations, non - destructive analysis, solid waste operations, and general plant operations.
Shift Supervisors	Directs and is responsible for the nuclear operator activities.
Plutonium Handlers	Handles or processes plutonium in contaminated enclosures and may work with other special nuclear, fissile, and radioactive materials

- \* These positions require certification because a credible criticality scenario is identified in the SAR or other appropriate documentation.

## 5. SUMMARY

There is no simple approach to the determination of significant quantities of fissionable materials as it relates to fissionable material handlers, and therefore, no simple answer to determine who should be certified on this basis. However, if all pertinent factors are considered and the facility criticality safety experts have been consulted, decisions should be reached on the basis of systematic evaluation and be justifiable. Finally, the process used to make the decision should be documented and decisions should be approved by appropriate contractor line management and DOE.